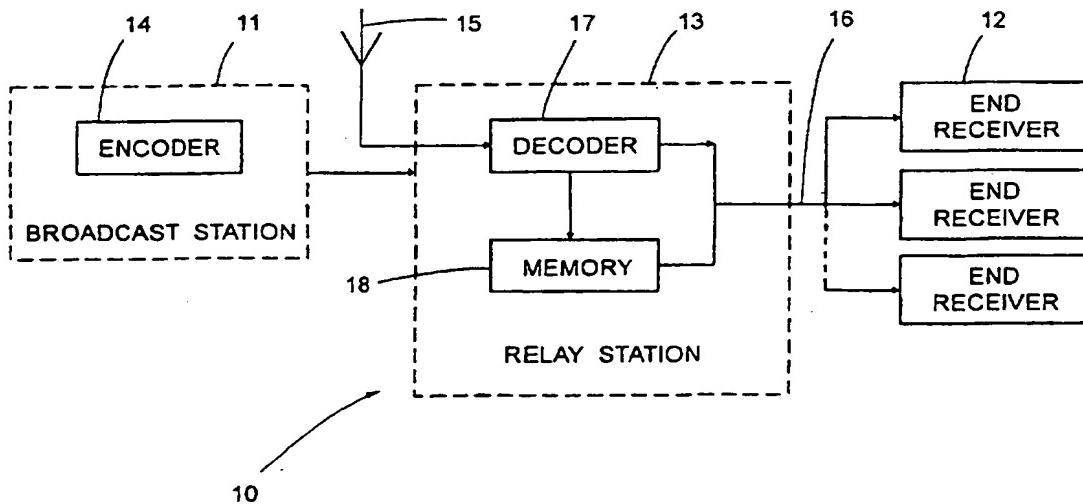




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(54) Title: METHOD AND SYSTEM FOR ON THE FLY SUBSTITUTION OF A SECTION OF A BROADCAST SIGNAL



## (57) Abstract

A system (10) and method for on-the-fly substitution of a section of a broadcast signal which enables a broadcaster (11), for example, to transmit simultaneously several different commercials in different languages to different countries. The invention may operate on both digital and analog techniques.

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**Method and system for on the fly substitution  
of a section of a broadcast signal**

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### **FIELD OF THE INVENTION**

This invention relates to broadcasting from a transmitter site to a plurality of end receivers via at least one relay station such as is done in cable TV.

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### **BACKGROUND OF THE INVENTION**

Cable TV companies transmit to their subscribers broadcasts which they in turn have received from a source transmitter. Typically, broadcasts are received in real time and are relayed to the end receivers 10 immediately on receipt without any pre-processing. It is not unusual for the broadcasts received from the source transmitter to include advertisements which may have little or no relevance to the local market to which the broadcast is ultimately relayed. This, of course, is particularly true when the source signal is broadcast to a foreign country wherein the advertised 15 products may not be available and/or the advertisements may be in what is, to the end receiver, a foreign language.

It would obviously be possible to capture the broadcast at the relay station and to process the source signal so as to detect the location of advertisements and then to substitute different advertisements more suitable 20 to the local market. Such data capture and processing requires extensive memory and relatively complex processing which increases costs for the relay station and thus for the subscribers.

## SUMMARY OF THE INVENTION

It is thus a primary object of the invention to allow sections of a broadcast signal transmitted from a source transmitter to a relay station to be substituted on the fly with different sections of substantially equal duration before being relayed to end receivers.

According to a broad aspect the invention there is provided in a system for relaying broadcast signals from a transmitter site to a plurality of end receivers via an intermediate relay station, a method for locally processing on the fly a section having a known length of a broadcast source signal, the method comprising the steps of:

- (a) embedding in the source signal a code signal indicative of a start of said section and of its time duration in such a manner that it is transparent to the end receivers of the broadcast signal,
- (b) transmitting the encoded source signal to the relay station,
- (c) re-transmitting the encoded source signal from the relay station to the plurality of end receivers until the code signal is received by the relay station,
- (d) decoding the code signal so as to determine the time duration of the section to be processed,
- (e) processing said section at the relay station and transmitting the processed section to the plurality of end receivers instead of the source signal for said time duration, and
- (f) repeating steps (c) to (e) as required for a remainder of the source signal.

When it is desired to employ the invention for substituting on the fly a section of a broadcast source signal, corresponding for example to an advertisement, with a substituted section of substantially equal length, step (e) comprises transmitting the substituted section to the plurality of end receivers instead of the source signal for the specified time duration. The start and duration of the section corresponding to the section to be substituted may be encoded by means of a sequence of adjacent frames each having a color which, in combination, is characteristic of the specified time duration.

## BRIEF DESCRIPTION OF THE DRAWINGS

In order to understand the invention and to see how it may be carried out in practice, a preferred embodiment relating to substitution on the fly of an advertisement embedded within a broadcast signal by a substitute advertisement will now be described by way of non-limiting example only, with reference to the accompanying drawings, in which:

Fig. 1 is a block diagram of a system for employing the invention therein; and

Figs. 2a to 2c are a flow diagram showing the principal steps associated with the method according to the invention.

## DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

Fig. 1 shows a system 10 comprising a remote broadcast station 11 for transmitting a TV broadcast signal (constituting a source signal) to a plurality of end receivers 12 (constituting cable TV subscribers) via a cable TV relay station 13. The broadcast station 11 includes an encoder 14 for encoding a section of the broadcast signal corresponding to an advertisement so as to produce a sequence of different colored frames whose color combination is representative of the time duration of the advertisement section according to a predetermined color code. The sequence of colored frames constitutes a code signal which is embedded within the source signal at the start of the advertisement section and thus whose presence is indicative of the start thereof. The relay station 13 includes a receiving antenna 15 for receiving the source signal and is connected by a cable 16 to the end receivers 12 for relaying the processed source signal thereto. The relay station 13 further includes a decoder 17 responsive to the received broadcast signal for detecting and decoding the code signal in order to determine the time duration of the advertisement section to be substituted.

A memory 18 within the relay station contains a database of substitute advertisements suitable for the local market and which may be substituted on the fly for foreign broadcasts embedded in the source signal. The substitute advertisements in the database are indexed according to time

duration and possibly according to other criteria, such as subject matter and audience suitability, etc. By such means, the database may be accessed and a particular advertisement may be selected according to predetermined criteria so as to replace a section of the broadcast signal corresponding to an advertisement transmitted by the remote broadcast station 11.

Fig. 2 shows the principal steps according to the method of the invention carried out by the remote broadcast station 11 together with the intermediate relay station 13 for substituting the source advertisement on the fly with a substitute advertisement selected from the database. A sequence 10 of adjacent different colored frames is embedded into the source signal indicating the start of the advertisement signal and whose color combination is representative of the time duration according to a predetermined color code. A sequence of several isolated colored frames displayed on the end receivers 12 will be transparent to the viewers thereof since they will flicker 15 on the screen for too short a time duration to be registered by the optic nerves of the viewers. By such means, the presence of an advertisement and its time duration in the source signal are encoded by the broadcast station in a manner which is transparent to the end receivers 12.

Upon receipt of the encoded broadcast signal by the relay station 20 13, the signal is decoded by the decoder 17 so as to extract the code signal indicative of the start of an advertisement section. The code signal is decoded so as to determine the time duration of the advertisement section which is then used as an index for accessing the database so as to select therefrom a suitable advertisement whose time duration is no greater than 25 the source advertisement. If desired, an advertisement section may be selected from the database according to other criteria in addition to time duration and such additional criteria may themselves be encoded within the code signal, as required.

The thus selected advertisement is now transmitted by the relay 30 station 13 instead of the source signal which continues to be received from the broadcast station 11 but is simply ignored until the selected advertisement has been transmitted in its entirety. It may be that the selected

advertisement is of slightly shorter duration than the source advertisement. In this case, in order to avoid a "hiccup" in the broadcast received by the end receivers 12, a fill-in image such as a test card and the like may be transmitted by the relay station 13 until the end of the decoded time duration, whereupon the source signal may again be broadcast until receipt by the relay station 13 of a subsequent code signal indicative of another advertisement section.

It is thus to be noted that the invention provides for virtually instantaneous substitution of a section of a broadcast signal with an already existing replacement signal. There is no need to create the substitute section on the fly either by image-processing the source signal or by any other means, because the substitute section is already stored in memory ready for immediate broadcasting. The only real-time processing which is therefore required is decoding the code signal and accessing the database, both of which impose very little premium on the transmission time and do not introduce any appreciable broadcast delay.

It will be appreciated that whilst the invention has been described with particular regard to a method and system for substituting on the fly an advertisement section of a broadcast signal with a replacement advertisement more suited to the local market, the invention is amenable to more general applications. Obviously, the substituted sections do not need to be advertisements: they could equally well be news items and other broadcast information not considered suitable for the local market. Likewise, the invention may find more general application wherever it is required to process an incoming broadcast signal on the fly prior to relaying to an end receiver.

**CLAIMS:**

1. In a system for relaying broadcast signals from a transmitter site to a plurality of end receivers via an intermediate relay station, a method for locally processing on the fly a section having a known length of a broadcast source signal, the method comprising the steps of:
  - (a) embedding in the source signal a code signal indicative of a start of said section and of its time duration in such a manner that it is transparent to the end receivers of the broadcast signal,
  - (b) transmitting the encoded source signal to the relay station,
  - 10 (c) re-transmitting the encoded source signal from the relay station to the plurality of end receivers until the code signal is received by the relay station,
  - (d) decoding the code signal so as to determine the time duration of the section to be processed,
  - 15 (e) processing said section at the relay station and transmitting the processed section to the plurality of end receivers instead of the source signal for said time duration, and
  - (f) repeating steps (c) to (e) as required for a remainder of the source signal.
- 20 2. The method according to Claim 1 for substituting on the fly a section of a broadcast source signal with a substituted section of substantially equal length, wherein step (e) comprises transmitting the substituted section to the plurality of end receivers instead of the source signal for said time duration.
- 25 3. The method according to Claim 2, wherein the substituted section is an advertisement.
- 30 4. The method according to Claim 3, wherein the substituted section is in a different language to that of the source signal.

5. The method according to any one of the preceding Claims, wherein the source signal is a TV broadcast signal and the code signal is a sequence of adjacent frames each having a color which, in combination, is characteristic of said time duration.

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6. The method according to any one of Claims 2 to 5, wherein step (e) comprises the steps of:

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- (1) accessing a database of pre-stored program sections for selecting a section having a duration no greater than said time duration of the section to be substituted,
- (2) transmitting the selected section in its entirety from the relay station to the end receivers, and
- (3) upon completion of step (2) transmitting a fill-in broadcast signal, as required, for a remainder of said time duration.

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7. The method according to Claim 6, wherein the database section is selected for other criteria in addition to the duration thereof.

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8. A system comprising a remote broadcast station for transmitting a source signal to a plurality of end receivers via a relay station 13 so as to substitute on the fly a source section of the source signal with a substituted section of substantially equal length;

wherein the broadcast station includes:

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an encoder for encoding the source section so as to produce a code signal representative of the time duration thereof, and  
means for embedding the code signal within the source signal at the start of the source section;

and wherein the relay station includes:

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a receiving antenna for receiving the encoded source signal,  
a decoder responsive to the encoded source signal for detecting and decoding the code signal in order to determine the time duration of the source section to be substituted,

a memory for storing a database of substitute sections being indexed according to at least time duration,

database access means coupled to the decoder and to the memory and responsive to the time duration for accessing the database so as to select a substitute section, and

5 a transmitting antenna coupled to the receiving antenna, to the memory and to the database access means for relaying desired components of the source signal and the selected section to the end receivers.

10

9. The system according to Claim 8, wherein the code signal is a sequence of adjacent frames each having a color which, in combination, is characteristic of said time duration.

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10. The system according to Claim 9 or 10, wherein the substituted section is an advertisement.

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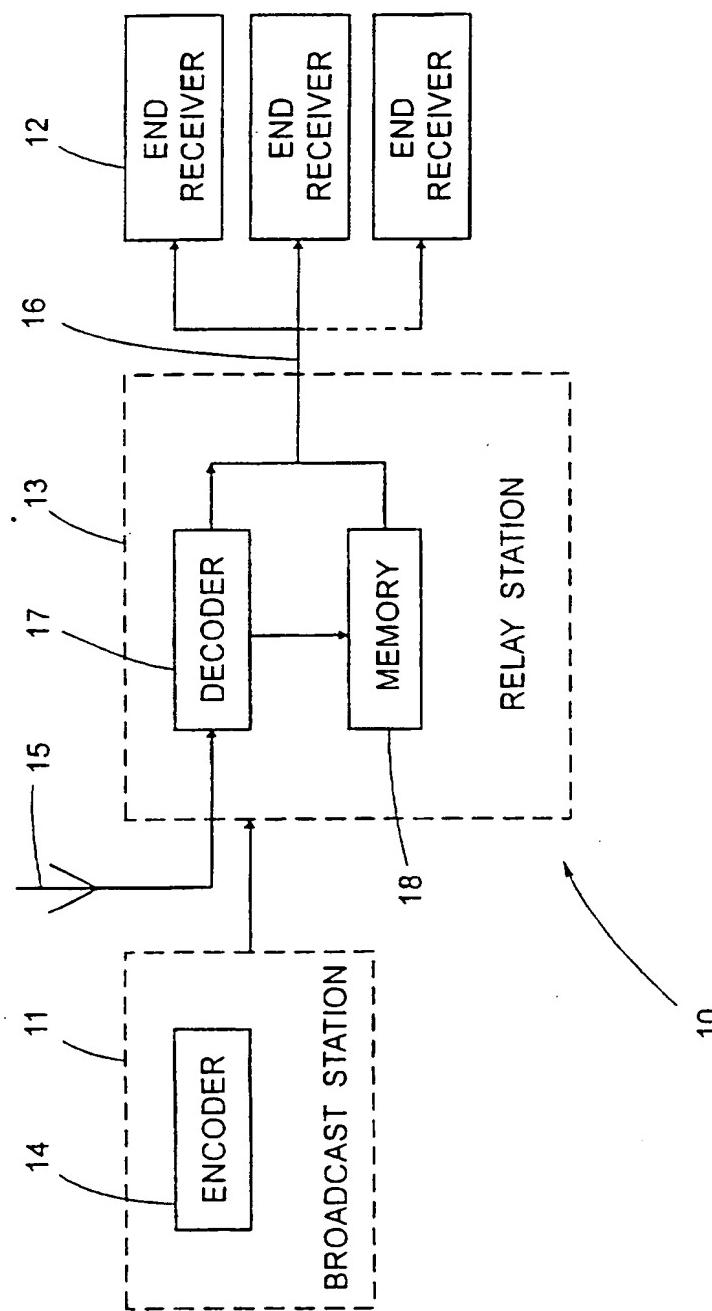


Fig. 1

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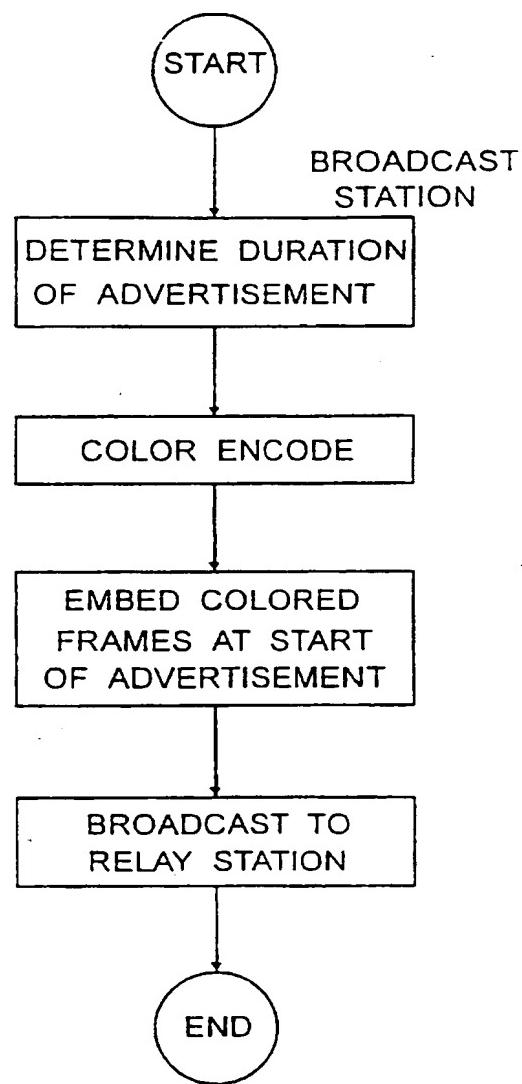
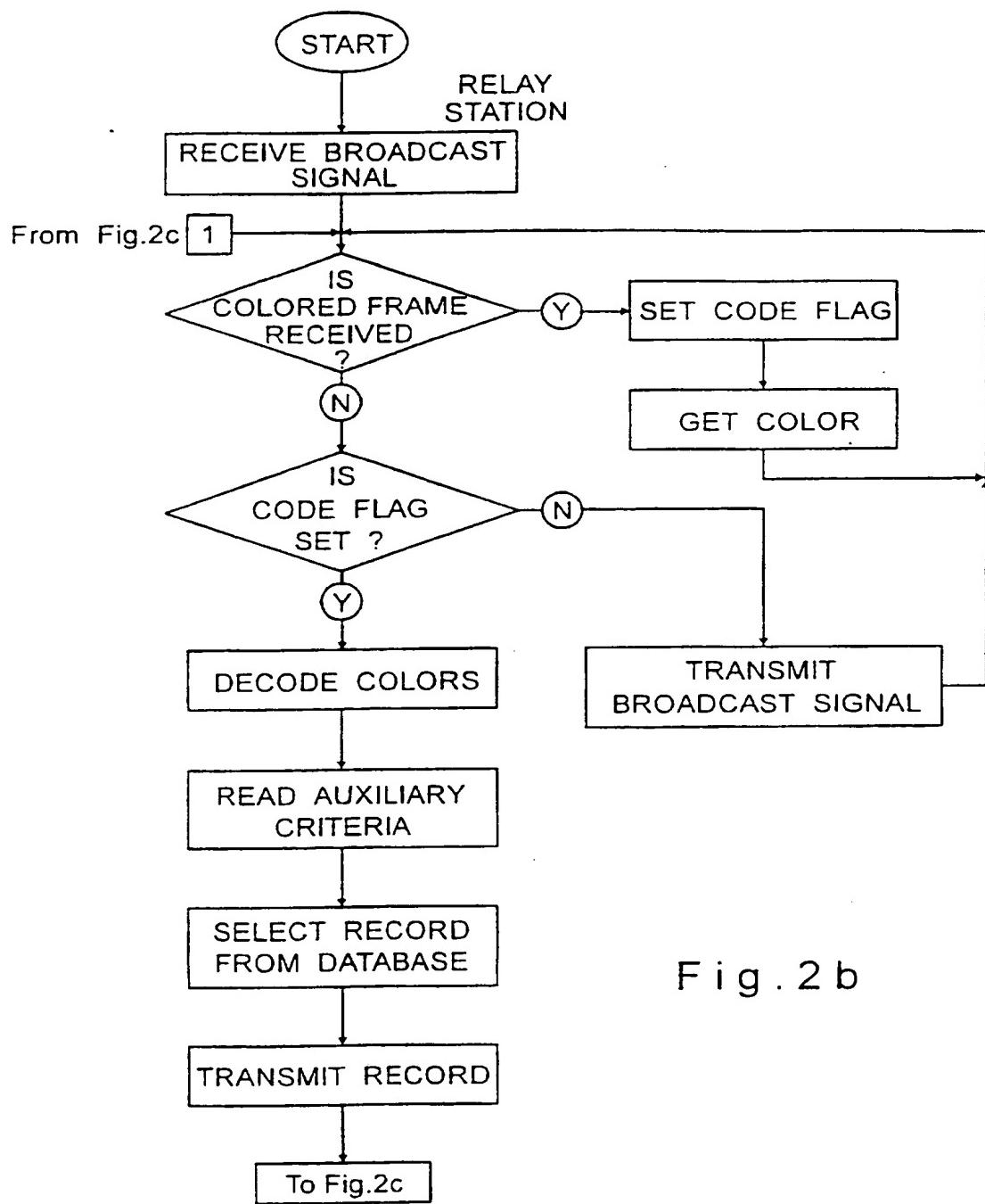


Fig. 2a



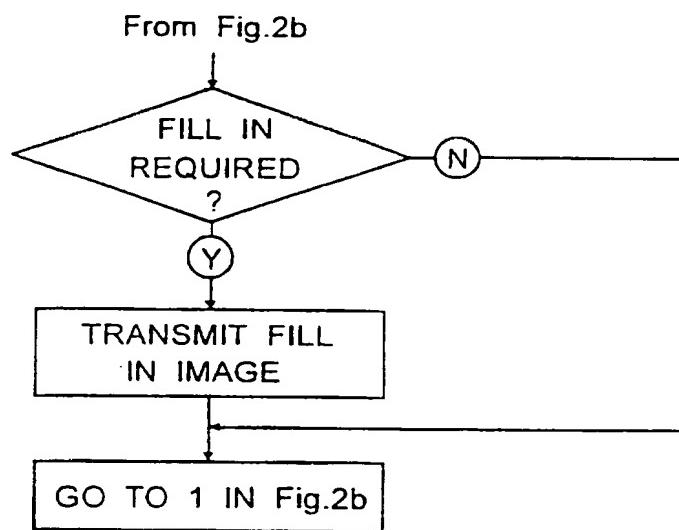


Fig. 2 c

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/IL97/00202

## A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :H04N 7/10

US CL :348/9

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 348/9, 474, 555, 558, 705, 441; 455/3.2, 4.1

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US, 5,424,770 A (SCHMELZER ET AL) 13 June 1995, col. 3, line 42 - col. 6, line 27.	1-3, 8 and 10
A	US 5,029,014 A (LINDSTROM) 02 July 1991, col. 2, lines 25-50.	1, 3, 8 and 10
A	US 5,444,491 A (LIM) 22 August 1995, col. 1, line 59 - col. 4, line 5.	1 and 8

Further documents are listed in the continuation of Box C.

See patent family annex.

*A*	Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"B"	document defining the general state of the art which is not considered to be of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
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Date of the actual completion of the international search

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Date of mailing of the international search report

17 NOV 1997

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**INTERNATIONAL SEARCH REPORT**

International application No.

PCT/IL97/00202

**Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)**

This international report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1.  Claims Nos.: because they relate to subject matter not required to be searched by this Authority, namely:
  
2.  Claims Nos.: because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
  
3.  Claims Nos.: 6 and 7 because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

**Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)**

This International Searching Authority found multiple inventions in this international application, as follows:

1.  As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
  
2.  As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
  
3.  As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
  
4.  No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

**Remark on Protest**

- The additional search fees were accompanied by the applicant's protest.  
 No protest accompanied the payment of additional search fees.

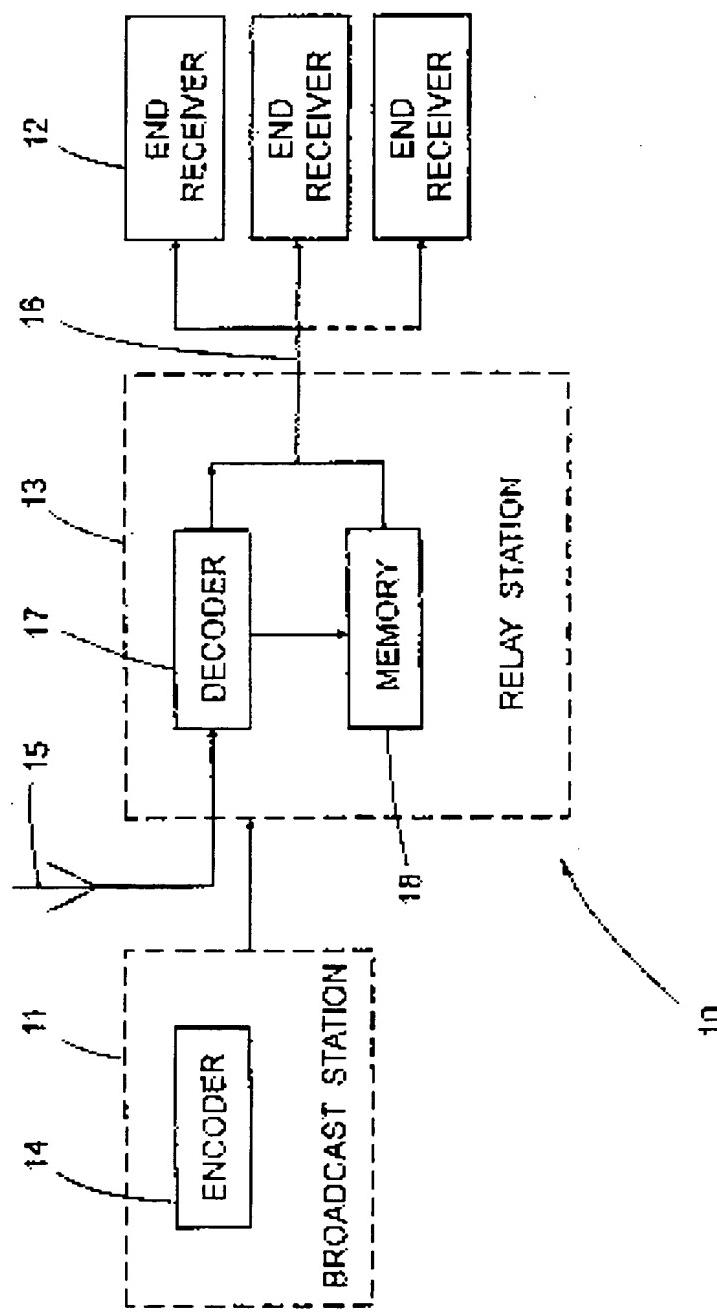


Fig. 1

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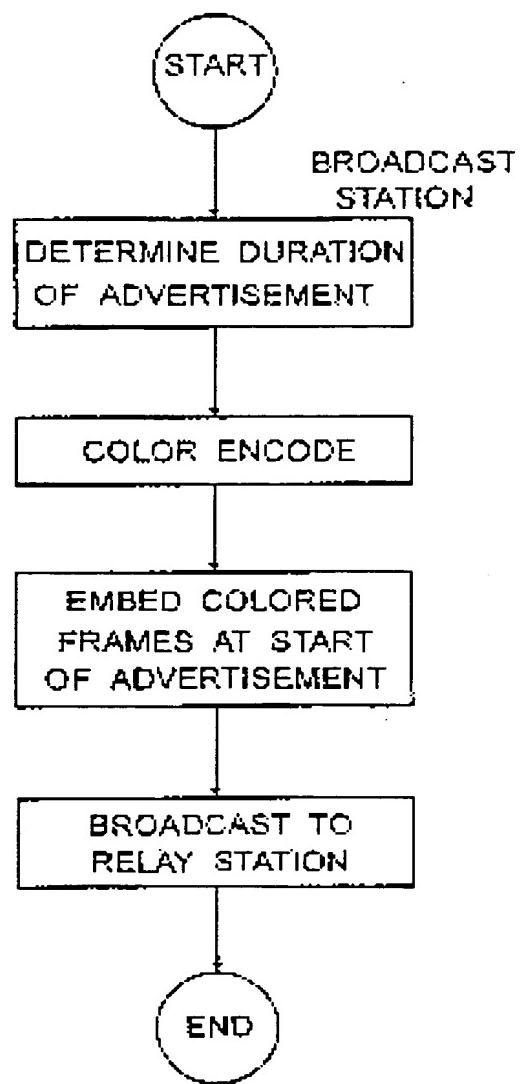
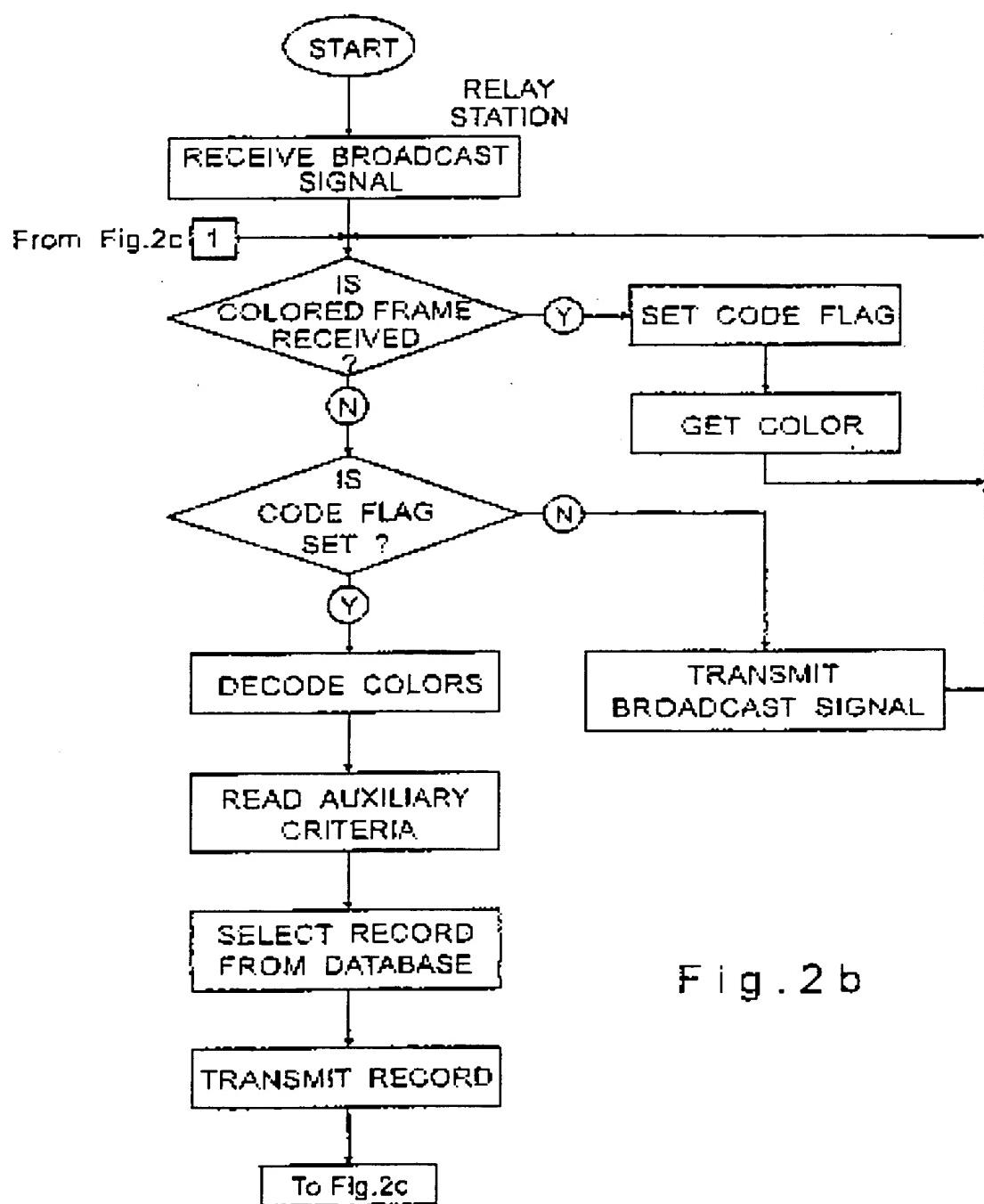


Fig. 2a



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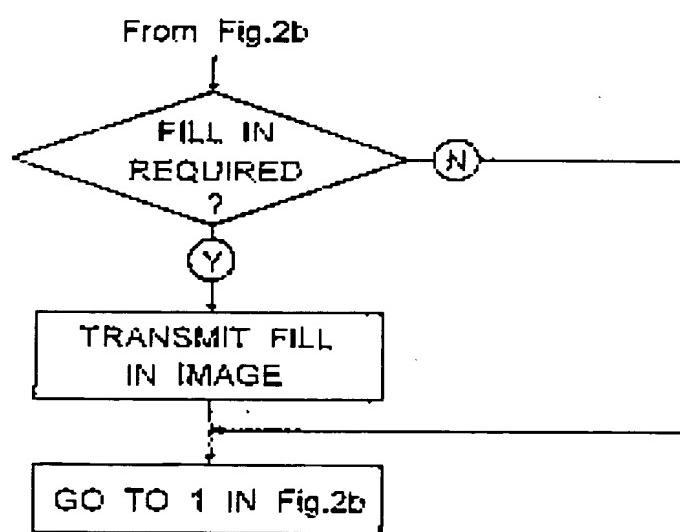


Fig. 2c